BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

front surface of the substrate;

a transistor provided over said insulating film, said transistor having at least a channel formation region, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween; and

[a pixel electrode over said transistor].

62. The device of claim 60 wherein said substrate is a glass substrate.

63. The device of claim 61 wherein said substrate is a glass substrate.

64. The device of claim 60 wherein said insulating film has a thermal conductivity of 0.6 W/cmK or higher.

65. The device of claim 61 wherein said insulating film has a thermal conductivity of 0.6 W/cmK or higher.

66. The device of claim 60 wherein aluminum to nitrogen ratio in said insulating film is in the range of 0.9 to 1.4.

67. The device of claim 61 wherein aluminum to nitrogen ratio in said insulating film is in the range of 0.9 to 1.4.--

REMARKS

At the outset, the Examiner is thanked for the review and consideration of the present application.

The Office Action of March 16, 2001 was received and reviewed. Reconsideration and withdrawal of the currently pending rejections are requested for the reasons advanced in detail below.

Claims 2, 3, 6-8, 11, 12, 15-17, 19-35 and 42-59 were pending prior to the instant amendment. By this amendment, claims 2, 3, 6-8, 19-24, 32-54, 55, 57, and 58 have been amended, and new claims 60-67 are added to recite additional features of the present invention to which Applicants are entitled. Consequently, claims 2, 3, 6-8, 11, 12, 15-17, 19-35 and 42-67 are pending in the instant application.

Claims 46, and 54-59 are rejected under 35 U.S.C. 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In particular, the Examiner is unclear whether "an insulating film" in claim 46, line 2, is different from the insulation film of claim 7, line 3; and, "said thin film transistor" in claim 54, lines 9-10, has no antecedent basis. Applicants have amended claims 46 to clarify that the insulating film is on the channel formation region, and 54 to delete the word "thin film." Accordingly, the 35 U.S.C. 112, second paragraph, rejection is respectfully requested to be reconsidered and withdrawn.

Claims 31-35, and 37-42 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter that is allegedly not described in the specification in a way to convey to one skilled in the art that the inventor had possession of the invention at the time of filing. More particularly, the Examiner alleged that the specification never discloses the aluminum nitride insulating film with a thickness of all the values of 5000 angstroms or less as recited in claims 31-35 and 37-42. Applicants have amended claims 32-42, as shown above to specify that the aluminum nitride insulating film has a thickness of 100Å to 5000Å.

OK

Claims 7, 9, 34, and 46 are rejected under 35 U.S.C. 103(a) as unpatentable over Mano et al., in view of Ikeda (JP 59-121876). Further, claims 3, 8, 12, 17, 20, 22-24, 26, 28-30, 32, 35, 38, 40-42, 44, 47, 49, and 51-53 are rejected over Troxell et al. in view of Ikeda, further in view of Yamazaki et al. (JP 62-112128). These rejections are traversed for the reasons advanced in detail below. These rejections are respectfully traversed at least for the reasons provided below.

Claims 2, 3, 6-8, 19-24, 32-35, 37-55, 57, and 58 have been amended to clearly cite the present invention that is generally directed to a semiconductor device comprising an insulating film of aluminum nitride provided over a front surface or under a rear surface of a substrate, wherein the insulating film comprises oxygen or carbon to control the tension of the insulating film. Applicants respectfully submit that this claimed feature does not appear to be addressed by

the Examiner as being taught, disclosed, or suggest by any of the cited prior art references. Therefore, a prima facie case of obviousness has not been established. Accordingly, the 103(a) rejections are respectfully requested to be reconsidered and withdrawn.

Claims 2, 3, 7, 8, 11, 12, 16, 17, 19, 20, 22-26, 28-32, 34, 35, 37, 38, 40-44, 46-49, and 51-53 are rejected under the judicially created doctrine of obviousness-type double patenting as unpatentable over claims 15-26 of U.S. Patent No. 5,583,369 in view of Troxell et al. Applicants respectfully request that this rejection be held in abeyance until all pending claims are in condition for allowance.

New claims 60-67 have been added to complete the scope of the invention to which Applicants are entitled.

In view of the foregoing, it is respectfully requested that the rejections of record be reconsidered and withdrawn by the Examiner, that claims 2, 3, 6-8, 11, 12, 15-17, 19-35, 37-59, and new claims 60-67 be allowed and that the application be passed to issue.

If a conference would expedite prosecution of the instant application, the Examiner is hereby invited to telephone the undersigned to arrange such a conference.

Respectfully submitted,

Luan C. Do
Registration No. 38,434

NIXON PEABODY LLP
8180 Greensboro Drive, Suite 800
McLean, Virginia 22102
(703) 790-9110
(703) 883-0370 FAX

VERSION OF AMENDED CLAIMS WITH
MARKINGS TO SHOW CHANGES MADE

2. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of carbon, and] oxygen provided under said rear surface of the substrate; and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween.

3. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of boron, silicon, carbon, and] oxygen provided under said rear surface of the substrate; and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween,

wherein said aluminum nitride insulating film has a thermal conductivity of 0.6 W/cmK or higher.

6. (Amended) [An active matrix type display] <u>A semiconductor device</u> comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of] carbon[, and oxygen] provided under said rear surface of the substrate; and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel

formation region with said gate insulating film interposed therebetween.

7. (Amended) [An active matrix type display] A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an insulating film comprising aluminum nitride and oxygen provided under said rear surface of the substrate; and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween,

wherein said insulating film comprising aluminum nitride has a thermal conductivity of 0.6 W/cmK or higher.

8. (Amended) [An active matrix type display] A semiconductor device comprising:

a substrate having a front surface and a rear surface;

[a multi-layer insulating film provided on said front surface of the substrate and comprising an aluminum nitride layer and a silicon oxide layer, said aluminum nitride layer and said silicon oxide layer being provided adjacent to each other; and]

an insulating film comprising aluminum nitride and carbon provided over said front surface of the substrate:

a transistor provided over said [multi-layer] insulating film, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween.

19. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of] carbon[, and oxygen] provided over said front surface of the substrate; and

a transistor provided over said aluminum nitride insulating film, said transistor

having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween.

20. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of boron, silicon,] carbon[, and oxygen] provided over said front surface of the substrate; and

a transistor provided over said aluminum nitride insulating film, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween,

wherein said aluminum nitride insulating film has a thermal conductivity of 0.6 W/cmK or higher.

21. (Amended) An active matrix type display comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of] carbon[, and oxygen] provided over said front surface of the substrate; and

a transistor provided over said aluminum nitride insulating film, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween.

22. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein at least [one of boron, silicon, carbon, and] oxygen provided under said rear surface of the substrate:

and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween,

wherein aluminum to nitrogen ratio in said aluminum nitride insulating film is in the range of 0.9 to 1.4.

23. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of boron, silicon,] carbon[, and oxygen] provided under said rear surface of the substrate; and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween,

[wherein said aluminum nitride insulating film has a thermal conductivity of 0.6 W/cmK or higher, and]

wherein aluminum to nitrogen ratio in said aluminum nitride insulating film is in the range of 0.9 to 1.4.

24. (Amended) A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of boron, silicon,] carbon[, and oxygen] provided over said front surface of the substrate; and

a transistor provided over said aluminum nitride insulating film, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween,

wherein aluminum to nitrogen ratio in said aluminum nitride insulating film is in

the range of 0.9 to 1.4.

32. (Amended) The device of claim 3 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

33. (Amended) The display of claim 6 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

34. (Amended) The display of claim 7 wherein said insulating film comprising aluminum nitride has a thickness of 100 Å to 5000 Å [or less].

35. (Amended) The display of claim 8 wherein said aluminum nitride layer has a thickness of 100 Å to 5000 Å [or less].

37. (Amended) The device of claim 19 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

38. (Amended) The device of claim 20 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

39. (Amended) The device of claim 21 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

40. (Amended) The device of claim 22 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

41. (Amended) The device of claim 23 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

42. (Amended) The device of claim 24 wherein said aluminum nitride insulating film has a thickness of 100 Å to 5000 Å [or less].

43. (Amended) The device of claim 2 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

44. (Amended) The device of claim 3 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

45. (Amended) The device of claim 6 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

46. (Amended) The device of claim 7 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

47. (Amended) The device of claim 8 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

48. (Amended) The device of claim 19 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

49. (Amended) The device of claim 20 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

50. (Amended) The device of claim 21 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

51. (Amended) The device of claim 22 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

52. (Amended) The device of claim 23 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

53. (Amended) The device of claim 24 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

54. (Amended) [An active matrix type liquid crystal display] A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of carbon and] oxygen provided under said rear surface of the substrate; and

a transistor provided over said front surface of the substrate, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween;

an interlayer insulating film having a leveled upper surface over said [thin film] transistor; and

a pixel electrode over said interlayer insulating film.

55. (Amended) The device of claim 54 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.

57. (Amended) [An active matrix type liquid crystal display] A semiconductor device comprising:

a substrate having a front surface and a rear surface;

an aluminum nitride insulating film containing therein [at least one of] carbon [and oxygen] provided over said front surface of the substrate;

a transistor provided over said aluminum nitride insulating film, said transistor having at least a channel formation region comprising crystalline silicon, a gate insulating film adjacent to said channel formation region, and a gate electrode adjacent to said channel formation region with said gate insulating film interposed therebetween;

an interlayer insulating film having a leveled upper surface over said [thin film] transistor; and

a pixel electrode over said interlayer insulating film.

58. (Amended) The device of claim 57 wherein said channel formation region is crystallized by laser irradiation through [a] an insulating film on said channel formation region.